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| International Union for the Protection of New Varieties of Plants |  |

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| Working Group on Biochemical and Molecular Techniques and DNA-Profiling in ParticularNineteenth SessionAlexandria, United States of America, September 23 to 25, 2020 | BMT/19/10Original: EnglishDate: September 3, 2020 |

**session to facilitate cooperation**

*Document prepared by the Office of the Union*

*Disclaimer: this document does not represent UPOV policies or guidance*

Executive summary

 The purpose of this document is to recall the outcomes of discussion groups formed in 2019 to allow participants to exchange information on their work on biochemical and molecular techniques and explore areas for cooperation.

 The BMT is are invited to note:

 (a) that the TWPs and BMT, at their sessions in 2019, formed discussion groups to allow participants to exchange information on their work on biochemical and molecular techniques and explore areas for cooperation;

 (b) the outcomes of discussions at the TWPs and BMT on facilitating cooperation in relation to the use of molecular techniques, as presented in the Annex to this document; and

 (c) that participants at the nineteenth session of the BMT will be invited to report on their work on biochemical and molecular techniques and explore areas for cooperation.

 The following abbreviations are used in this document:

BMT: Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular

ISTA: International Seed Testing Association

OECD: Organization for Economic Co-operation and Development

TC: Technical Committee

TWA: Technical Working Party for Agricultural Crops

TWC: Technical Working Party on Automation and Computer Programs

TWF: Technical Working Party on Fruit Crops

TWO: Technical Working Party on Ornamental Plants and Forest Trees

TWPs: Technical Working Parties

TWV: Technical Working Party for Vegetables

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ANNEX SESSION TO FACILITATE COOPERATION IN RELATION TO THE USE OF MOLECULAR TECHNIQUES

# Background

 The background to this matter is provided in document BMT/18/5.

 At their sessions in 2019, the TWO, TWV, TWF, TWA and TWC considered document TWP/3/7 “Molecular Techniques”. Each TWP undertook a coordination session to build on the outcomes from the seventeenth session of the BMT and feed into the work of the eighteenth session of the BMT. Discussion groups were formed for the main crops at each TWP to allow participants to exchange information on their work on biochemical and molecular techniques and explore areas for cooperation (see documents TWO/51/12 “Report”, paragraphs 52 and 53, TWV/53/14 “Report”, paragraph 57, TWF/50/13 “Report”, paragraph 75, TWA/48/9 “Report”, paragraphs 72 and 73, and TWC/37/12 “Report”, paragraphs 73 and 92)..

 The BMT, at its eighteenth session, considered document BMT/18/5 “Session to facilitate cooperation” and formed discussion groups to allow participants to exchange information on their work on biochemical and molecular techniques and explore areas for cooperation (see document BMT/18/21 “Report”, paragraphs 38 and 41).

 The outcomes of discussions held at the TWPs and BMT, at their sessions in 2019, are reproduced in the Annex to this document

Consideration by the Technical Committee

 The TC, at its fifty-fifth session[[1]](#footnote-2), noted that, at their sessions in 2019, the TWPs and the BMT had formed discussion groups to allow participants to exchange information on their work on biochemical and molecular techniques and explore areas for cooperation. The TC noted the outcomes of discussions at the TWPs, as reproduced in the Annex to this document, which had been reported to the BMT, at its eighteenth session (see document TC/55/25 “Report”, paragraph 192).

# Next steps

 Participants at the nineteenth session of the BMT will be invited to report on their work on biochemical and molecular techniques and explore areas for cooperation on the basis of a poll to be conducted during the BMT session.

 *The BMT is invited to note:*

 *(a) that the TWPs and BMT, at their sessions in 2019, formed discussion groups to allow participants to exchange information on their work on biochemical and molecular techniques and explore areas for cooperation;*

 *(b) the outcomes of discussions at the TWPs and BMT on facilitating cooperation in relation to the use of molecular techniques, as presented in the Annex to this document; and*

 *(c) that participants at the nineteenth session of the BMT will be invited to report on their work on biochemical and molecular techniques and explore areas for cooperation.*

[Annex follows]

2019 Session to facilitate cooperation in relation to the use of molecular techniques

Technical Working Party for Ornamental Plants and Forest Trees

 The following information was provided by TWO participants (see document TWO/51/12 “Report”, paragraphs 52 and 53):

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| Australia | * DNA information may be used in some cases of infringement action;
* currently considering constituting DNA collection for native species
 |
| China | * crop interest: forestry sector and woody ornamentals, *Fraxinus* in particular;
* currently developing databases with DNA information for Rose, Poplar and Tree Peony
 |
| European Union:  | * applicants for new varieties of Rose can request for a fee to have a DNA sample extracted and stored; similar procedure for fruit crops under consideration
 |
| France | * crop interest: Hydrangea;
* currently testing a set of molecular markers for Hydrangea varieties
 |
| Netherlands | * crop interest: *Chrysanthemum*, *Gypsophila, Helleborus*, *Lilium, Phalaenopsis* and Rose;
* currently building a DNA database for *Fraxinus* and *Ulmus*;
* DNA information used for varietal identity;
* possible future development of databases with DNA information for ornamental plants
 |

The TWO agreed that possible UPOV initiatives could include the development of guidance on collecting DNA samples, ownership of material collected and how to facilitate the use of material or information.

Technical Working Party for Vegetables

Following subgroup discussions, the following information was provided by TWV participants (see document TWV/53/14 “Report”, paragraph 57):

*Summary of crops and authorities currently using (or under development) biochemical and molecular techniques in the vegetable sector*

|  |  |
| --- | --- |
| Tomato | China, European Union, (France), (Italy), Netherlands, Republic of Korea |
| Pepper | China, (France), Republic of Korea |
| Watermelon | Republic of Korea |
| Melon | (France), Republic of Korea |
| Lettuce | France, (Italy), Japan, (Netherlands), Republic of Korea |
| Cabbage | European Union, Netherlands, Republic of Korea  |
| Mushroom | Japan |
| French bean | Netherlands |
| Pea | (Netherlands), (United Kingdom)  |
| Onion | Netherlands |
| Eggplant | (China) |

*Summary of current use of biochemical and molecular techniques in the vegetable sector*

|  |
| --- |
| Use: |
| Management of reference collections |
| Selection of similar varieties/ grouping characteristics |
| Variety identification |
| Enforcement of IP Rights/ infringement |
| Check specific characteristics (e.g. male sterility, disease resistance: as replacement or addition to bioassay) |
|  |
| Techniques: |
| SSRs |
| SNPs |
| Electrophoresis (Isoenzyme) |

*Summary of possible areas of cooperation for the use of biochemical and molecular techniques in the vegetable sector*

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| --- |
| Encourage sharing of data & techniques |
| Facilitate cooperation & training |
| Encourage exchange of DNA/market set (no living organisms) and seeds |
| Ensuring consistency among UPOV members in the use of BMT |
| Identify focal point for molecular techniques in DUS examination for each UPOV member and make this information available via the UPOV website |
| Develop guidance on collecting DNA samples, ownership of material exchanges (confidentiality) |
| Update guidance on how to use information and exchange DNA material |
| Explore the possibility to build a “UPOV” DNA database, “UPOV” marker set |
| Develop guidance and/or training for specialized courts/ experts |
| Set up comparative trials (e.g. Harmores project) |
| Encourage and promote the work of the BMT as platform to improve cooperation and encourage participation from members |
| Encourage and improve cooperation with breeders and their representatives |

Technical Working Party for Fruit Crops

Following subgroup discussions, the following information was provided by TWF participants (see document TWF/50/13 “Report”, paragraph 75):

*Summary of crops and authorities currently using biochemical and molecular techniques in the fruit sector*

|  |  |
| --- | --- |
| Czech Republic | Grapevine |
| France | Apple, Peach, Pear, Sweet Cherry, Apricot, Japanese Plum |
| Germany | Pear, Apple, Strawberry, Sweet Cherry, Sour Cherry |
| Republic of Korea | Apple, Grapevine, Peach, Pear, Strawberry |
| Morocco | Citrus, Date Palm |
| Italy | Grapevine |
| Hungary | Grapevine, Peach, Cherry, Sour Cherry, Apricot, Plum,  |
| Spain | Almond, Apricot, Avocado, Banana, Cherimoya, Citrus, Fig tree Grapevine, Hazelnut Mango, Peach, Pear, Pineapple, Strawberry, Sweet Cherry, Walnut,  |
| Japan | Apple, Citrus, Pineapple, Japanese Pear, Sweet Cherry, Strawberry, Grapevine |

*Summary of current use of biochemical and molecular techniques in the fruit sector*

|  |
| --- |
| Use: |
| Management and description of variety collections  |
| Genetic distance and molecular profiling |
| Uniformity assessment |
| Research purposes  |
| Enforcement |
| Identification of varieties for certification scheme purposes.  |
|  |
| Techniques: |
| SSR |
| SNPs |

*Summary of possible areas of cooperation for the use of biochemical and molecular techniques in the fruit sector*

|  |
| --- |
| Develop and share common databases (identifying a leading country and coordinator) |
| Sharing techniques |
| Harmonize projects/markers/methods/procedures |
| Exchange of knowledge and techniques |
| Encourage crop experts to attend BMT meetings |

Technical Working Party for Agricultural Crops

The following information was provided by TWA participants (see document TWA/48/9 “Report”, paragraphs 72 and 73):

*Summary of crop and authorities currently using (or under development) molecular techniques in the agricultural sector*

|  |  |
| --- | --- |
| Argentina | Soya Bean, Cotton, Rice, Wheat, Barley |
| Australia | Sugarcane, Wheat, Cotton |
| Brazil | Soya Bean |
| Canada  | Potato |
| China | Maize, Wheat, Cotton, Rape Seed, Sunflower, Potato, Sorghum, Rice, Soya Bean |
| Czech Republic | Maize, Wheat, Barley  |
| Dominican Republic | Rice, Sugarcane, Cacao  |
| European Union | Potato, Maize, Rape Seed |
| Germany | Potato, Maize, Rape Seed |
| Italy  | Soya Bean, Rice, Khorasan Wheat  |
| Japan | French bean, Adzuki Bean, Tea, Sunflower, Maize, Potato |
| Kenya | Tea, Tomato, Maize |
| Republic of Korea | 30 crops |
| Slovakia | Potato |
| United Kingdom | Potato, Rape Seed |
| United States of America | Maize, Soya Bean  |
| Uruguay | Soya Bean, Maize, Wheat |

*Summary of current use of molecular techniques in the agricultural sector*

|  |
| --- |
| Techniques: |
| CAPS (JP) |
| Elisa (IT, UY) |
| MNP (CN) |
| PCR (IT, KE, UY) |
| QPCR (UY) |
| RAPID STS (JP) |
| SNP (AR, AU, CN, DE, GB, IT, JP, KR, QZ, US, UY)  |
| SSR (BR, CN, CZ, DK\*, GB, IT, JP, KR, QZ, SK) \*sporadic use |
|   |
| Use: |
| DUS examination, incl. selection of similar varieties and management of variety collections (CN, CZ, KR, QZ) |
| complementary tool for uniformity (AR, IT) |
| databases for Potato (CA, DE, GB, NL, QZ, SK) |
| database for Maize, Rape Seed (QZ) |
| sample authentication (GB) |
| variety purity in certified seeds (IT, KR) |
| GMO detection (AR, IT, KR, UY) |
| Bt gene detection (AU) |
| virus assessment (KR) |
| variety identification (AR, BR, CN, DK, IT, UY) |
| market control of seed trade (UY) |
| enforcement (AR, JP) |

*Summary of possible areas of cooperation for the use of molecular techniques in the agricultural sector*

|  |
| --- |
| International collaboration for the constitution of common databases  |
| Addressing practical aspects such as access rights, financial issues, incl. benefit sharing and material transfer agreements |
| Provision of training to UPOV members on the use of BMTs in DUS examination |
| Sharing sets of markers and protocols to reduce size of variety collections |
| Cooperation on testing varieties with similar genetic background |
| Addressing confidentiality issues |

Technical Working Party on Automation and Computer Programs

The following information was provided by TWC participants (see document TWC/37/12 “Report”, paragraphs 73 and 92):

*Summary of crop and authorities currently using biochemical and molecular techniques*

|  |  |
| --- | --- |
| Argentina  | Soybean |
| Brazil | *Eucalyptus*, Soybean  |
| China | Broccoli, Cauliflower, Chinese cabbage, Eggplant, Lettuce, Maize, Pepper, Rice, Rose, Sorghum, Strawberry, Walnut, Wheat, Fruit trees, Ornamentals, Soybean, Cotton, and other 29 crops |
| Denmark  | Barley, Oats, Rye, Wheat, Forage grasses |
| European Union | Lettuce, Maize, Potato, Wheat, Vegetable, Barley, Sunflower |
| France | Maize, Oilseed rape |
| Italy | Soybean, Rice |
| Japan | Rice, Green tea, Strawberry, Japanese pear, French bean, Sweet cherry, Apple, Lettuce  |
| Netherlands | French bean, *Phalaenopsis*, Potato, Rose, Tomato  |
| Republic of Korea | Chinese cabbage, Cucumber, Lettuce, Melon, Pepper, Pumpkin, Radish, Rice, Tomato |
| Russian Federation | Maize, Potato, Soybean, Sunflower, Wheat |
| United Kingdom | Barley, Potato, Oilseed rape |

*Summary of current use of biochemical and molecular techniques*

|  |
| --- |
| Use: |
| Management of variety collection and selection of similar varieties |
| Validation of male sterility and disease resistance |
| Validation of DUS/VCU samples  |
| Variety identification |
| Research purposes  |
| Breeding |
|  |
| Techniques: |
| ALFP (NL) |
| CAPS (JP)  |
| MNP (CN) |
| OSR-SSR (FR) |
| PRG-SNPs (NL) |
| RAPID – STS (JP) |
| SSR (BR, CN, DK, GB, IT, JP, KR, NL, QZ) |
| SNPs (AR, CN, FR, DK, GB, NL, QZ) |

*Summary of databases with molecular marker information, by crops*

|  |  |
| --- | --- |
| Argentina  | Soybean (under development) |
| China | Apple, Cotton, Maize (for research), Pepper, Rice, Rose, Sorghum, Soybean, Walnuts, Wheat, Fruit trees |
| Denmark  | Barley, Wheat, Forage grasses |
| European Union | Potato |
| France | Maize |
| Italy | Soybean |
| Netherlands | French bean, *Phalaenopsis*, Potato  |
| United Kingdom | For research  |

Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular

*Maize and Soybean*

Summary of crop interest

|  |  |
| --- | --- |
| Maize | China, Germany, Kenya, Russian Federation, ISTA, SAA  |
| Soybean | Argentina, Brazil, China, ISTA  |

Plans for cooperation

* Argentina will publish a set of 4004 SNP markers for the management of variety collections in Soybean and will inform Brazil and the United States of America with a view to their testing the discriminating power of this set.
* Brazil to discuss with the Brazilian breeders association the proposal on the use of molecular markers in DUS examination for soybeans (e.g. similar to the study conducted in Argentina).
* China to make the new Maize 6H-60K SNP chip available for testing .

Summary of current use of biochemical and molecular techniques

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| --- |
| Germany: isoenzymes for management of variety collection and DUS examination (maize) |
| China: Maize 6H-60K SNP chip for consideration of essential derivation; protocol for variety identification in maize and soybean; creation of a database and selection of similar varieties; general protocol for variety identification using SSR |
| Argentina: SNP for management of variety collection and variety identity |
| Brazil: SSR for variety identity |
| SAA: genetic similarity in soybean varieties |
| ISTA: electrophoresis, seed proteins, SSR (ISTA Rules, Chapter 8) |

Proposals on confidentiality and access to data

* DNA-fingerprint data to be treated as confidential;
* Variety identification data using a small number of SNP markers could be made publicly available
* Consent by the breeder should be required before sharing of DNA-based information;
* Breeders should be informed about the publication of variety identification by SNPs;
* Parental line information should be treated as confidential

*Other agricultural crops*

Summary of crop interest

|  |  |
| --- | --- |
| Barley | Argentina, Estonia, Germany, Italy, United Kingdom, ISTA  |
| *Cannabis sativa* | Estonia, Italy, Netherlands, United Kingdom |
| Cotton | Argentina, ISTA |
| Perennial Ryegrass | Germany, Netherlands, New Zealand, United Kingdom |
| Potato | Estonia, Germany, Netherlands, Russian Federation, United Kingdom |
| Rice | Argentina, China, Italy, Japan, ISTA |
| Sunflower | Russian Federation |
| Sweet Potato | United Kingdom  |
| Wheat | Argentina, China, Estonia, Germany, Italy, United Kingdom, ISTA |

Plans for cooperation

* Ryegrass: Belgium, Czech Republic and the Netherlands to share information on their work and plans;
* Oilseed rape: France, Germany, CPVO and the United Kingdom to develop a set of molecular markers for the management of variety collections;
* INVITE and INNOVAR (scope of 10 crops) participating countries to develop markers sets for variety testing;
* Argentina to contact BMT participants on sets of markers for Barley, Cotton, Rice and Wheat.

Summary of current use of biochemical and molecular techniques

|  |
| --- |
| Netherlands and the United Kingdom: SNPs for management of variety collections |
| China: 90K SNP chip for wheat; development of testing standard for SSR in wheat; creation of a database for wheat varieties; SSR markers for selection of similar varieties and variety purity |
| Germany: electrophoresis for Barley, Wheat and Oat, Ryegrass, Potato for DUS examination |
| Italy: electrophoresis in maize, sunflower, wheat, barley for DUS examination and variety identification; SSR for variety hybridity in Rice and variety identification |
| Japan: RAPD-STS markers for infringement cases in French Bean and Rice |
| Russian Federation: SSR for identification in Sunflower and Potato.  |
| United Kingdom: electrophoresis for Barley, Wheat and Oat, Ryegrass, for DUS examination; SSR and SNP for sample validation and variety identification |
| ISTA: maize, wheat and soybean: SSR and electrophoresis; barley: SSR; Other crops: electrophoresis |

Proposals for confidentiality and access to data

Participants at the discussion group on other agricultural crops agreed with the proposals by the discussion group on Maize and Soybean.

*Vegetables*

Summary of crop interest

|  |  |
| --- | --- |
| Cabbage | China, Republic of Korea |
| Chinese cabbage | China, Republic of Korea |
| Cucumber | China, Netherlands, Republic of Korea |
| Eggplant | Italy |
| French bean | Netherlands |
| Lettuce | Australia, Italy, Netherlands, Republic of Korea  |
| Melon | China, Netherlands, Republic of Korea  |
| Onion | Italy, Netherlands  |
| Oriental melon | Republic of Korea |
| Pea | Netherlands, United Kingdom  |
| Pepper | China, Italy, Netherlands, Republic of Korea |
| Pumpkin | Republic of Korea |
| Radish | Republic of Korea |
| Shallot | Netherlands |
| Squash | Italy |
| Tomato | China, France, Italy, Japan, Netherlands, Republic of Korea |
| Watermelon | China, Italy, Republic of Korea |

*Summary of current use of biochemical and molecular techniques*

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| --- |
| Use: |
| Research (NL)  |
| TGP/15 Model 1 (JP, NL, FR) |
| French bean example (NL) |
| Variety identifications (CN, IT, NL) |
|  |
| Techniques: |
| AFLP (NL) |
| Capillary electrophoresis fragment analysis (IT) |
| MNP (CN) |
| SNPs (NL, CN, IT) |
| SSR (CN, IT)  |
| Taqman (NL) |
| Whole genome sequencing / GBS (CN, NL) |

Proposals for confidentiality and access to data

The discussion group on vegetables agreed to propose inviting breeders, observer organizations and other participants to make presentations on ownership matters during the breeders’ day at the nineteenth session of the BMT.

*Ornamental plants*

Summary of crop interest

|  |  |
| --- | --- |
| *Bougainvillea* | China |
| *Camellia* | China |
| *Chrysanthemum* | China, Netherlands |
| *Gypsophila* | Netherlands |
| *Helleborus* | Netherlands |
| *Hibiscus* | China |
| *Hydrangea* | France |
| *Lilium* | China |
| *Phalaenopsis* | Netherlands |
| Rose | China, Netherlands, CIOPORA |
| Tree Peony | China |

Plans for cooperation

* Rose: China, Netherlands and CIOPORA to discuss a methodology for validating a set of molecular markers between laboratories.
* Chrysanthemum, Rose, Tree peony: China to explore cooperation on developing molecular markers with other UPOV members.

Summary of current use of biochemical and molecular techniques

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| --- |
| Use: |
| Variety identification (CN) |
| Research (CN, FR) |
|  |
| Techniques: |
| SSR (CN, FR)  |
| SNPs (CN) |

Proposals on confidentiality and access to data

* To develop an agreement template with breeders for the use of molecular data. The template should include a requirement for a description of the intended use of the data.

*Fruit crops and forest trees*

Summary of crops of interest

|  |  |
| --- | --- |
| Citrus | China, Italy, Spain |
| Persimmon | Spain, Republic of Korea |
| Peach  | Italy, Hungary, Spain |
| Strawberry | Italy, Hungary, Spain |
| Goji Berry | China |
| Walnut | China |

Plans for cooperation

|  |  |
| --- | --- |
| Citrus – under consideration | Spain to propose collaboration initiative with Italy |
| Persimmon | Spain, Republic of Korea |
| Peach  | Italy, Hungary |
| Strawberry – under consideration | Italy, Hungary |

Summary of current use of biochemical and molecular techniques

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| --- |
| Australia: possible use of microsatellites in some enforcement cases. |
| China: SSR markers for variety identification in Apple, Chinese Dates, Citrus, Apricot, Goji Berry and Fraxinus |
| European Union: collaboration on epigenetic markers in apple;  |
| Japan: considering the use of SSR for enforcement for grapes and CAPS for citrus. |
| Republic of Korea: SSR for Apple, Peach, Grape, Pear and persimmon.  |
| Spain: SSR for variety identification; use of SNP for research, including DUS testing |

Proposals on confidentiality and access to data

New Zealand has published position on access and use of plant material including molecular data. For example, molecular data would only be provided with permission of breeder.

 [End of Annex and of document]

1. Held in Geneva on October 28 and 29, 2020 [↑](#footnote-ref-2)